USER GUIDE AND SPECIFICATIONS
NI USB-9237

4-Channel, 24-Bit Half/Full-Bridge Analog Input Device

> このドキュメントの日本語版については、ni.com/manuals
> を参照してください。(For a Japanese language version, go to ni.com/
> manuals.)

This user guide describes how to use the National Instruments USB-9237 and lists the device specifications. The NI USB-9237 provides a USB interface for four channels of 24-bit half/full-bridge analog input.

Introduction

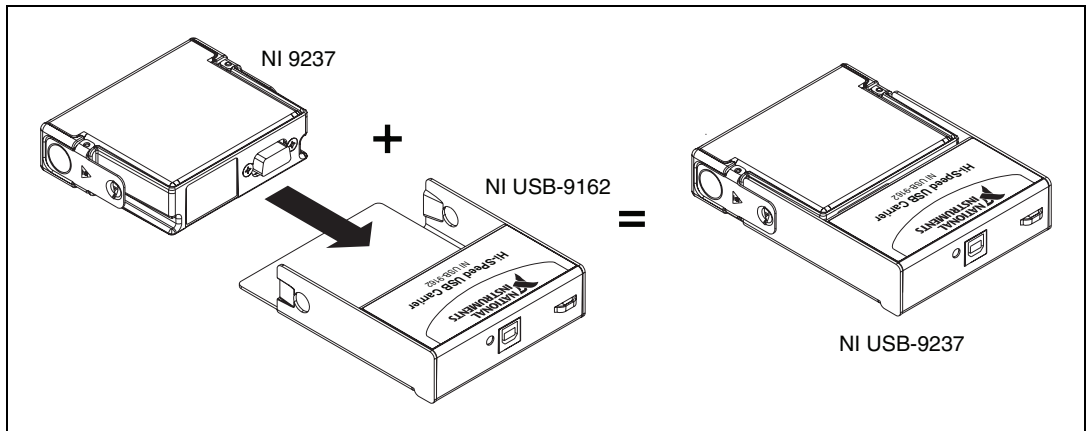The NI USB-9237 consists of two components: an NI 9237 module and an NI USB-9162 carrier, as shown in Figure 1.

Figure 1. NI USB-9237 Components

Dimensions

Figure 2 shows the NI USB-9237 device dimensions.

123.67 mm (4.869 in.) 120.68 mm (4.751 in.)
121.28 mm (4.775 in.) 118.29 mm (4.567 in.)

Hi-Speed USB Carrier
NI USB-9162

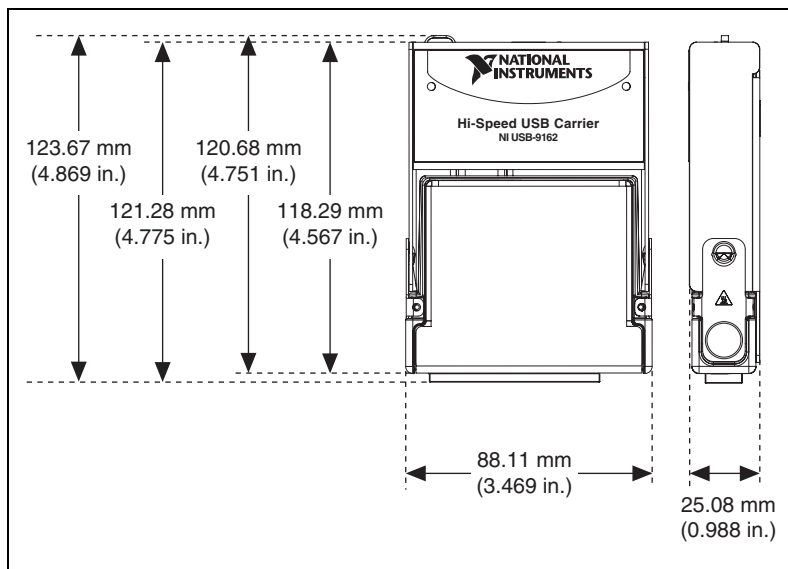88.11 mm (3.469 in.)

25.08 mm (0.988 in.)

Figure 2. NI USB-9237 Device in Millimeters (Inches)

Safety Guidelines

Operate the NI USB-9237 only as described in these operating instructions.

Note Although the NI 9237 module may have more stringent certification standards than the NI USB-9237, when used with the NI USB-9162 carrier, the combined system may be limited. Refer to the *Specifications* section for more details.

Hot Surface This icon denotes that the component may be hot. Touching this component may result in bodily injury.

Caution Do *not* disconnect I/O-side wires or connectors unless power has been switched off or the area is known to be nonhazardous.

Caution Do *not* remove modules unless power has been switched off or the area is known to be nonhazardous.

Caution The NI USB-9237 is *not* certified for use in hazardous locations.

Related Documentation

Each application software package and driver includes information about writing applications for taking measurements and controlling measurement devices. The following references to documents assume you have NI-DAQmx 8.7 or later, and where applicable, version 7.1 or later of the NI application software.

NI-DAQmx for Windows

The *DAQ Getting Started Guide* describes how to install your NI-DAQmx for Windows software, your NI-DAQmx-supported DAQ device, and how to confirm that your device is operating properly. Select **Start»All Programs»National Instruments»NI-DAQ»DAQ Getting Started Guide**.

The *NI-DAQ Readme* lists which devices are supported by this version of NI-DAQ. Select **Start»All Programs»National Instruments»NI-DAQ» NI-DAQ Readme**.

The *NI-DAQmx Help* contains general information about measurement concepts, key NI-DAQmx concepts, and common applications that are applicable to all programming environments. Select **Start»All Programs»National Instruments»NI-DAQ»NI-DAQmx Help**.

LabVIEW

If you are a new user, use the *Getting Started with LabVIEW* manual to familiarize yourself with the LabVIEW graphical programming environment and the basic LabVIEW features you use to build data acquisition and instrument control applications. Open the *Getting Started with LabVIEW* manual by selecting **Start»All Programs»National Instruments»LabVIEW»LabVIEW Manuals** or by navigating to the labview\manuals directory and opening LV_Getting_Started.pdf.

Use the *LabVIEW Help*, available by selecting **Help»Search the LabVIEW Help** in LabVIEW, to access information about LabVIEW programming concepts, step-by-step instructions for using LabVIEW, and reference information about LabVIEW VIs, functions, palettes, menus, and tools. Refer to the following locations on the Contents tab of the *LabVIEW Help* for information about NI-DAQmx:

- **Getting Started»Getting Started with DAQ**—Includes overview information and a tutorial to learn how to take an NI-DAQmx measurement in LabVIEW using the DAQ Assistant.

- **VI and Function Reference»Measurement I/O VIs and Functions**—Describes the LabVIEW NI-DAQmx VIs and properties.

- **Taking Measurements**—Contains the conceptual and how-to information you need to acquire and analyze measurement data in LabVIEW, including common measurements, measurement fundamentals, NI-DAQmx key concepts, and device considerations.

LabWindows/CVI

The **Data Acquisition** book of the *LabWindows/CVI Help* contains measurement concepts for NI-DAQmx. This book also contains *Taking an NI-DAQmx Measurement in LabWindows/CVI*, which includes step-by-step instructions about creating a measurement task using the DAQ Assistant. In LabWindows™/CVI™, select **Help»Contents**, then select **Using LabWindows/CVI»Data Acquisition**.

The **NI-DAQmx Library** book of the *LabWindows/CVI Help* contains API overviews and function reference for NI-DAQmx. Select **Library Reference»NI-DAQmx Library** in the *LabWindows/CVI Help*.

Measurement Studio

If you program your NI-DAQmx-supported device in Measurement Studio using Visual C++, Visual C#, or Visual Basic .NET, you can interactively create channels and tasks by launching the DAQ Assistant from MAX or from within Visual Studio .NET. You can generate the configuration code based on your task or channel in Measurement Studio. Refer to the *DAQ Assistant Help* for additional information about generating code. You also can create channels and tasks, and write your own applications in your ADE using the NI-DAQmx API.

For help with NI-DAQmx methods and properties, refer to the NI-DAQmx .NET Class Library or the NI-DAQmx Visual C++ Class Library included in the *NI Measurement Studio Help*. For general help with programming in Measurement Studio, refer to the *NI Measurement Studio Help*, which is fully integrated with the Microsoft Visual Studio .NET help. To view this help file in Visual Studio. NET, select **Measurement Studio» NI Measurement Studio Help**.

To create an application in Visual C++, Visual C#, or Visual Basic .NET, follow these general steps:

1. In Visual Studio .NET, select **File»New»Project** to launch the New Project dialog box.

2. Find the Measurement Studio folder for the language you want to create a program in.

3. Choose a project type. You add DAQ tasks as a part of this step.

ANSI C without NI Application Software

The *NI-DAQmx Help* contains API overviews and general information about measurement concepts. Select **Start»All Programs»National Instruments»NI-DAQ»NI-DAQmx Help**.

The *NI-DAQmx C Reference Help* describes the NI-DAQmx Library functions, which you can use with National Instruments data acquisition devices to develop instrumentation, acquisition, and control applications. Select **Start»All Programs»NationalInstruments»NI-DAQ» NI-DAQmx C Reference Help**.

.NET Languages without NI Application Software

With the Microsoft .NET Framework version 1.1 or later, you can use NI-DAQmx to create applications using Visual C# and Visual Basic .NET without Measurement Studio. You need Microsoft Visual Studio .NET 2003 or Microsoft Visual Studio 2005 for the API documentation to be installed.

The installed documentation contains the NI-DAQmx API overview, measurement tasks and concepts, and function reference. This help is fully integrated into the Visual Studio .NET documentation. To view the NI-DAQmx .NET documentation, go to **Start»Programs»National Instruments»NI-DAQ»NI-DAQmx .NET Reference Help**. Expand **NI Measurement Studio Help»NI Measurement Studio .NET Class Library»Reference** to view the function reference. Expand **NI Measurement Studio Help»NI Measurement Studio .NET Class Library»Using the Measurement Studio .NET Class Libraries** to view conceptual topics for using NI-DAQmx with Visual C# and Visual Basic .NET.

To get to the same help topics from within Visual Studio, go to **Help»Contents**. Select **Measurement Studio** from the **Filtered By** drop-down list and follow the previous instructions.

Device Documentation and Specifications

NI-DAQmx includes the Device Document Browser, which contains online documentation for supported DAQ, SCXI, and switch devices, such as help files describing device pinouts, features, and operation, and PDF files of the printed device documents. You can find, view, and/or print the documents for each device using the Device Document Browser at any time by inserting the CD. After installing the Device Document Browser, device documents are accessible from **Start»All Programs»National Instruments»NI-DAQ»Browse Device Documentation**.

✎ **Note** You can download these documents at ni.com/manuals.

Training Courses

If you need more help getting started developing an application with NI products, NI offers training courses. To enroll in a course or obtain a detailed course outline, refer to ni.com/training.

Technical Support on the Web

For additional support, refer to ni.com/support or zone.ni.com.

Installing the Software

Software support for the NI USB-9237 for Windows Vista/XP/2000 is provided by NI-DAQmx. The *DAQ Getting Started Guide*, which you can download at ni.com/manuals, offers NI-DAQmx users step-by-step instructions for installing software and hardware, configuring channels and tasks, and getting started developing an application.

Installing Other Software

If you are using other software, refer to the installation instructions that accompany your software.

Example Programs

The NI-DAQmx CD contains example programs that you can use to get started programming with the NI USB-9237. Refer to the *NI-DAQmx for USB Devices Getting Started Guide* that shipped with your device, and is also accessible from **Start»All Programs»National Instruments» NI-DAQ**, for more information.

# Installing the NI USB-9237 Device

Before installing the device, you must install the software you plan to use with the device. Refer to the *Installing the Software* section of this guide and the documentation included with the software for more information.

Installing the NI 9237 in the USB-9162 Carrier

The NI 9237 module and USB-9162 carrier are packaged separately. Refer to Figure 3, while completing the following assembly steps:

1. Make sure that no signals are connected to the NI 9237 module and the USB cable is not connected to the device.

2. Remove the protective cover from the 15-pin D-SUB connector.

3. Align the I/O module with the carrier, as shown in Figure 3.
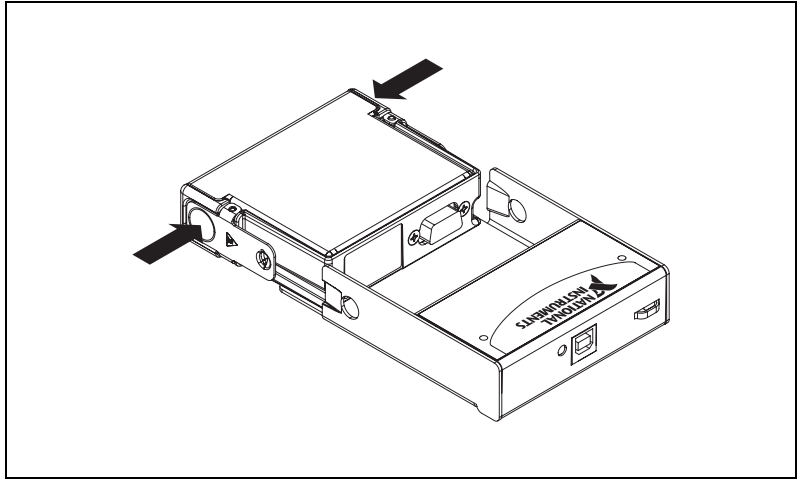
Figure 3. Module Installation

4. Squeeze the latches and insert the NI 9237 module into the USB-9162 carrier.

5. Press firmly on the connector side of the NI 9237 module until the latches lock the module into place, as shown in Figure 4.
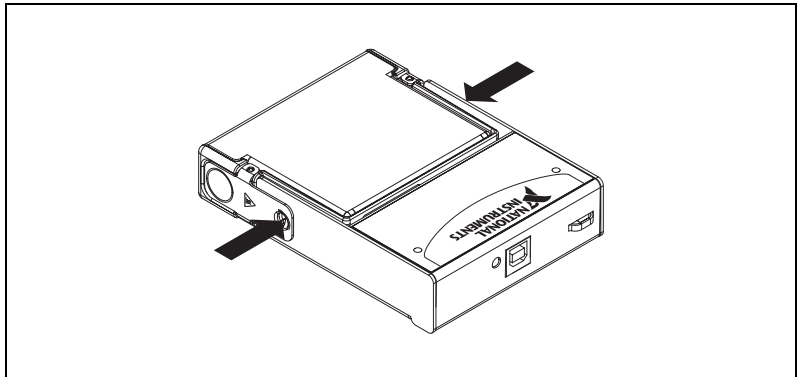
Figure 4. Locking Module into Place

Mounting the NI USB-9237 to a Panel

Threaded inserts are located in the NI USB-9237 for mounting it to a panel. Refer to Figure 5 for dimensions.
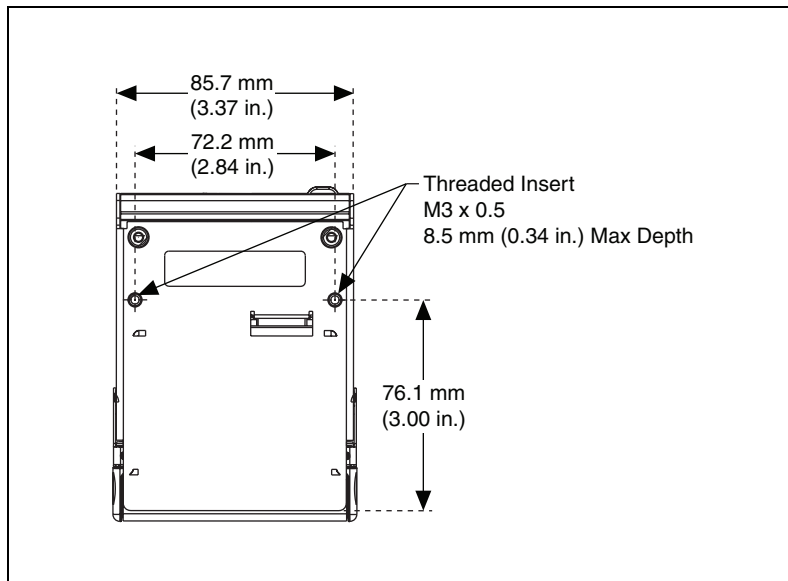

Figure 5. Module Dimensions in Millimeters (Inches)

Connecting the NI USB-9237 to a Computer

Plug one end of the USB cable into the NI USB-9237 and the other end into an available USB port on the computer. Refer to the *NI-DAQmx for USB Devices Getting Started Guide* that shipped with your device, and is also accessible from **Start»All Programs»National Instruments»NI-DAQ**, for more information.

LED Indicator

The NI USB-9237 device has a green LED next to the USB connector. The LED indicator indicates device status, as listed in Table 1. When the device is connected to a USB port, the LED blinks steadily to indicate that the device is initialized and is receiving power from the connection.

If the LED is not blinking, it may mean that the device is not initialized or the computer is in standby mode. In order for the device to be recognized, the device must be connected to a computer that has NI-DAQmx installed on it. If your device is not blinking, make sure your computer has the latest version of NI-DAQmx installed on it, and the computer is not in standby mode.

Table 1. LED State/Device Status

LED State	Device Status
Not lit	Device not connected or in suspend.
On, not blinking	Device connected, but no module installed.
Single-blink	Operating normally.
Double-blink	Connected to USB Full-Speed port. Device performance might be affected. Refer to the *Specifications* section for more information.
Quadruple-blink	Device error. Refer to ni.com/support.

Wiring the NI USB-9237 Device
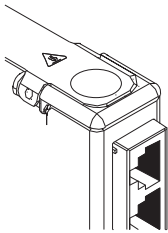
The NI USB-9237 has four RJ-50 receptacles that provide connections for four half or full bridges. Table 2 lists the signal names of the terminals for each connector, and shows the correlation between the pin numbers of the RJ-50 10-position/10-conductor (10p10c) modular plug and the NI USB-9237 receptacle. The NI USB-9237 also has a four-position connector you can use to connect an external excitation voltage source to the module. Table 2 lists the connections between an external excitation voltage source and the NI USB-9237.

✎ **Note** For a list of accessories available for use with the NI USB-9237, refer to ni.com/info, and enter info code rd9237.

Table 2. Terminal Assignments

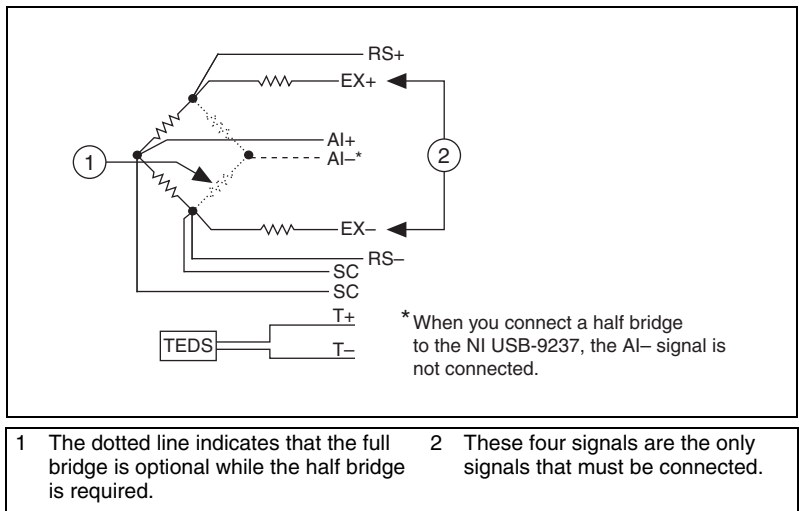| RJ-50 (10p10c) Modular Plug and Receptacle Pin Numbers	RJ-50 Pin	RJ-45 Pin	Signal Name	Signal Description
	1	—	SC	Shunt calibration
	2	1	AI+	Positive input signal
	3	2	AI–	Negative input signal
	4	3	RS+	Positive remote sense signal
	5	4	RS–	Negative remote sense signal
	6	5	EX+	Positive excitation signal*
	7	6	EX–	Negative excitation signal*
	8	7	T+	TEDS data
	9	8	T–	TEDS return*
	10	—	SC	Shunt calibration
* These signals are shared by all four RJ-50 connectors on the NI USB-9237.				

⚠ **Caution** National Instruments does not recommend using an RJ-45 with the NI USB-9237 because it can physically damage pins 1 and 10 on the device, and thus permanently disable shunt calibration no matter what connector you use.

| 1 EX– | 2 EX+ | 3 EX+ | 4 EX– |
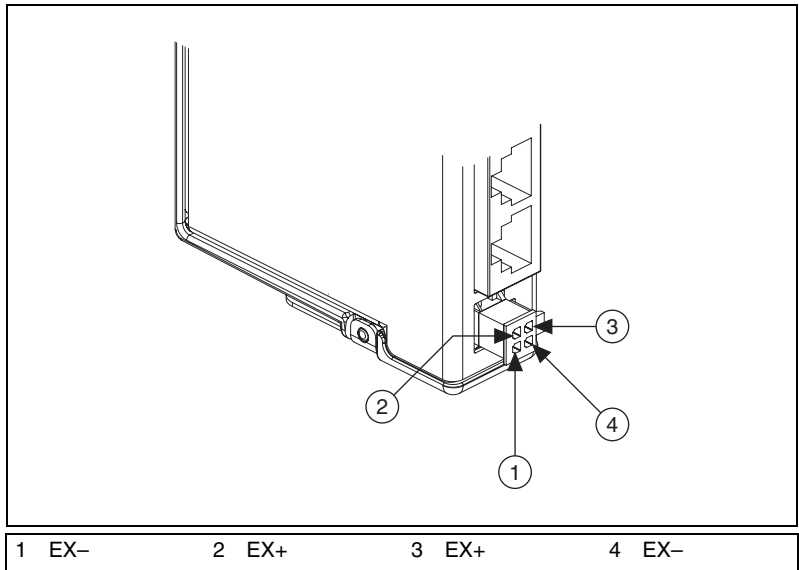
Figure 6. Four Position External Excitation Voltage Source Connection

Connecting Loads to the NI USB-9237

Refer to Figure 7 for an illustration of how to connect full and half bridges to the NI USB-9237.

| 1 | The dotted line indicates that the full bridge is optional while the half bridge is required. | 2 | These four signals are the only signals that must be connected. |

Figure 7. Half- and Full-Bridge Connections

Note You can use a quarter bridge with the NI USB-9237 if you either add a resistor externally to create a half bridge or use the NI 9944 or NI 9945 Quarter Bridge Completion Accessory. Visit ni.com and search for the NI 9944 and/or NI 9945 Quarter Bridge

Completion Accessories for more information about these accessories and how to purchase them.

Wiring TEDS Channels

Ensure that neither the TEDS data (T+) nor the TEDS return (T−) is tied in common to any AI signals on the NI USB-9237. Visit ni.com/info and enter the info code rdteds for information about TEDS sensors.

NI USB-9237 Connection Options

Wiring resistance can create errors in bridge circuits. The NI USB-9237 provides two mechanisms to correct for these errors: remote sensing and shunt calibration.

Remote Sensing

Remote sensing continuously and automatically corrects for errors in excitation leads, and generally is most appropriate for full- and half-bridge sensors.

Long wire and smaller gauge wire has greater resistance, which can result in gain error. The voltage drop caused by resistance in the wires connecting the excitation voltage to the bridge is a source of gain error.

The NI USB-9237 includes remote sensing to compensate for this error. Remote sense wires are connected to the point where the excitation voltage wires connect to the bridge circuit.

Figure 8 shows a diagram of how the NI USB-9237 uses remote sensing.
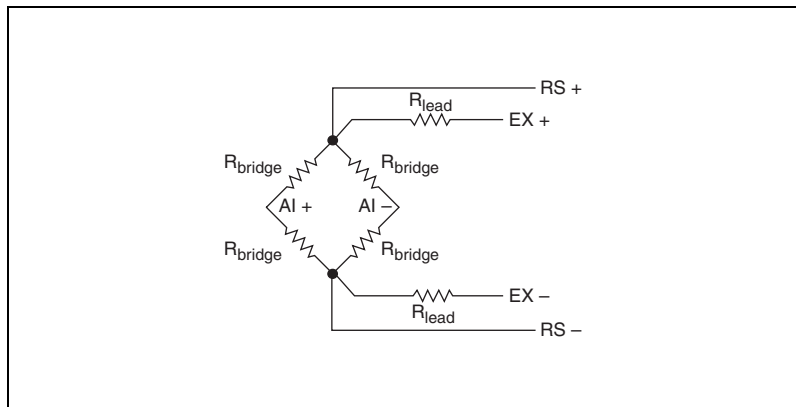
Figure 8. Remote Sensor Error Compensation

As shown in Figure 8, the actual bridge excitation voltage is smaller than the voltage at the EX+ and EX– leads. If remote sensing of the actual bridge voltage is not used, the resulting gain error is

$$\frac{2R_{lead}}{R_{bridge}}$$

for full-bridge sensors, and

$$\frac{R_{lead}}{R_{bridge}}$$

for half-bridge sensors.

If the remote sense (RS) signals are connected directly to the bridge resistors, the NI USB-9237 senses the actual bridge voltage sense and eliminates the gain errors caused by the resistance of the EX+ and EX– leads.

Shunt Calibration

Shunt calibration can correct for errors from the resistance of both the excitation wiring and wiring in the individual resistors of the bridge. Shunt calibration is most useful with quarter-bridge sensors because there may be significant resistance in the wiring to the active resistor in the bridge.

The NI USB-9237 shunt calibration circuitry consists of a precision 100 kΩ resistor and a software-controlled switch. You can leave the shunt calibration terminals connected to the sensor, and then apply or remove the shunt calibration resistance in software.

While remote sensing corrects for resistances from the EX terminals on the NI USB-9237 to the sensor, shunt calibration corrects for these errors and for errors caused by wire resistance within an arm of the bridge.

Shunt calibration involves simulating the input of strain by changing the resistance of an arm in the bridge by some known amount. This is accomplished by shunting, or connecting, a large resistor of known value across one arm of the bridge, creating a known strain-induced change in resistance. The output of the bridge can then be measured and compared to the expected voltage value. The results are used to correct gain errors in the entire measurement path, or to simply verify general operation to gain confidence in the setup.

A stable signal, which is typically the unloaded state of the sensor, is used first with the shunt calibration switch off and then again with the switch on. The difference in these two measurements provides an indication of the gain errors from wiring resistances. You can design the software application to correct subsequent readings for this gain error.

Excitation Voltages

Although the sensor industry does not recognize a single standard excitation voltage level, excitation voltage levels of between 2.5 V and 10 V are common. You can program the NI USB-9237 to supply 2.5 V, 3.3 V, 5 V, or 10 V of excitation voltage, and the module can provide up to 150 mW of excitation power. Unless you supply external excitation voltage, National Instruments recommends that you set the excitation voltage to a value that keeps the total power below 150 mW. The NI USB-9237 automatically reduces internal excitation voltages as needed to stay below 150 mW.

The power consumed by a single bridge is

$$\frac{V_{ex}^{2}}{R}$$

where R is the total resistance of the bridge.

For a full bridge, R is equal to the resistance of each element. For a half or quarter bridge, R is equal to two times the resistance of each element.

The 150 mW limit allows you to power full and half bridges as follows:

- Four 350 Ω half bridges at 5.0 V
- Four 350 Ω full bridges at 3.3 V
- Four 120 Ω half bridges at 2.5 V

If you need an excitation voltage greater than 150 mW, use the four-position external excitation voltage connector to connect an external excitation source to the NI USB-9237. Refer to Figure 6 for an illustration and pinout description of the four-position external excitation voltage connector.

NI USB-9237 Circuitry

The NI USB-9237 is isolated from earth ground. However, the individual channels are not isolated from each other. The EX+, EX–, and T– signals are common among all channels. You can connect the NI USB-9237 to a device that is biased at any voltage within the NI USB-9237 rejection range of earth ground. Refer to the *Specifications* section for more information.

You also can connect floating signals to the NI USB-9237. If you connect floating signals to the NI USB-9237, National Instruments recommends you connect the EX– signal to the earth ground or shield for better noise rejection.

Each channel on the NI USB-9237 has an independent 24-bit ADC and input amplifier that enable you to sample signals from all four channels simultaneously.

The NI USB-9237 also includes filters to prevent aliasing. The filters on the NI USB-9237 filter according to the sampling rate.

Understanding NI USB-9237 Filtering

The NI USB-9237 uses a combination of analog and digital filtering to provide an accurate representation of desirable signals while rejecting out-of-band signals. The filters discriminate between signals based on the frequency range, or bandwidth, of the signal. The three important bandwidths to consider are the passband, the stopband, and the alias-free bandwidth.

The NI USB-9237 represents signals within the passband as accurately as possible, as quantified primarily by passband flatness and phase nonlinearity. The filters reject frequencies within the stopband as much as possible, as quantified by stopband rejection. All signals that appear in the alias-free bandwidth are either unaliased signals or signals that have been filtered by at least the amount of the stopband rejection.

Passband

The signals within the passband have frequency-dependent gain or attenuation. The small amount of variation in gain with frequency is called the passband flatness. The filters of the NI USB-9237 adjust the frequency range of the passband to match the data rate. Therefore, the amount of gain or attenuation at a given frequency depends on the data rate. Figure 9 shows typical passband flatness for a range of data rates.
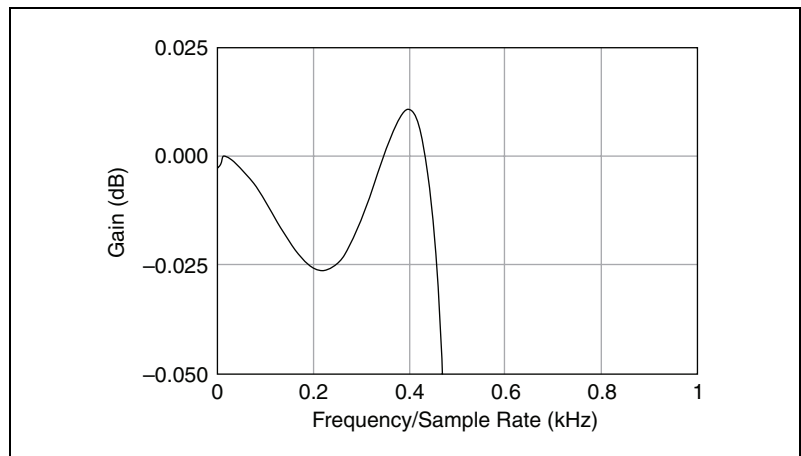
Figure 9. Typical Passband Response

Stopband

The filter significantly attenuates all signals above the stopband frequency. The primary goal of the filter is to prevent aliasing. Therefore, the stopband frequency scales precisely with the data rate. The stopband rejection is the minimum amount of attenuation applied by the filter to all signals with frequencies that would be aliased into the alias-free bandwidth.

Alias-Free Bandwidth

Any signal that appears in the alias-free bandwidth of the NI USB-9237 is not an aliased artifact of signals at a higher frequency. The alias-free bandwidth is defined by the ability of the filter to reject frequencies above the stopband frequency and equals the data rate minus the stopband frequency.

Specifications

The following specifications are typical for the range 0 to 60 °C unless otherwise noted.

Input Characteristics

Number of channels 4

Bridge completion

    Full and half....................................Internal

    Quarter..External

ADC resolution......................................24 bits

Type of ADC ....Delta-sigma (with analog prefiltering)

Sampling mode ....Simultaneous

Data rates (f_s) ....$\dfrac{50.000 \text{ kS/s}}{n}$, $n = 1, 2, \ldots 31$

Master timebase (internal)

    Frequency ....12.8 MHz

    Accuracy..± 100 ppm max

Nominal full-scale range ....± 25 mV/V

Scaling coefficient ....2.9802 nV/V per LSB

Overvoltage protection
between any two terminals.....................± 30 V

Accuracy

Error*	Percent of Reading (Gain Error)	Percent of Range (Offset Error)†
Calibrated max (0 to 60 °C)	0.20%	0.25%
Calibrated typ (25 °C, ±5 °C)	0.05%	0.05%
Uncalibrated max (0 to 60 °C)	0.60%	0.35%
Uncalibrated typ (25 °C, ±5 °C)	0.20	0.1%
* Excluding offset null or shunt calibration. † Range equals 25 mV/V.		

Gain drift...10 ppm/°C max

Offset drift

    2.5 V excitation...............................0.6 µV/V per °C

    3.3 V excitation...............................0.5 µV/V per °C

    5 V excitation..................................0.3 µV/V per °C

    10 V excitation...............................0.2 mV/V per °C

Channel-to-channel matching (calibrated)

Input Signal Frequency (f_{in})	Gain		Phase
	Typical	Maximum	Maximum
0 to 1 kHz	0.15%	0.3%	$0.125°/\text{kHz} \cdot f_{in}$*
1 to 20 kHz	0.4%	1.1%	
* f_{in} is in kHz.			

Phase nonlinerarity

    0 to 1 kHz.......................................<0.001°

    0 to 20 kHz.....................................± 0.1°

Input delay..4.8 µs + 38.4/f_s

Passband

    Frequency.......................................0.45 · f_s

    Flatness ....0.1 dB max

Stopband

    Frequency ....$0.55 \cdot f_s$

    Rejection...100 dB

Alias-free bandwidth ....$0.45 \cdot f_s$

Oversample rate ....$64 \cdot f_s$

    Rejection at oversample rate[1]

        50 kS/s.....................................90 dB @ 3.2 MHz

        10 kS/s.....................................60 dB @ 640 kHz

Common-mode voltage

    All signals to earth ground ....± 60 VDC

Common-mode rejection ratio (CMRR)

    Relative to earth ground[2]................140 dB @ 0 to 60 Hz

    Relative to EX– ....85 dB @ 0 to 1 kH

Input noise

Excitation Voltage	Density (nV/V$_{rms}$ per $\sqrt{1\,\mathrm{Hz}}$)	Total (50 kS/S) (µV/V$_{rms}$)	0 to 1 kHz (nV/V$_{rms}$)
2.5 V	8	1.3	250
3.3 V	6	1.0	190
5 V	4	0.6	130
10 V	2	0.3	65

Spurious-free dynamic
range (SFDR)...106 dB,
                      (1 KHz, –60 dBFS)

Total harmonic distortion (fundamental @ –20 dBFS)

    1 kHz ....100 dB

    8 kHz ....90 dB

Excitation noise ....0.1 mV/V$_{rms}$

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[1] Rejection by analog prefilter of signal frequencies at oversample rate.

[2] Measured with a balanced cable. Shielded cables may be significantly unbalanced.

Crosstalk

    1 kHz.. 110 dB

    10 kHz.. 100 dB

Shunt calibration

    Resistance .... 100 kΩ

    Resistor accuracy

        25 °C...................................... ± 110 Ω

        0 to 60 °C............................... ± 200 Ω

Excitation

    Internal voltage .... 2.5 V, 3.3 V, 5.0 V, 10.0 V

    Internal power .... 150 mW max

    External voltage .... 2 V to 10 V

Power Requirements

Current consumption from USB .... 500 mA, max

    Suspend mode .... 2.5 mA, max

Bus Interface

USB specification................................... USB 2.0 Hi-Speed

Physical Characteristics

Dimensions... 12.1 cm × 8.6 cm × 2.5 cm
(4.75 in. × 3.37 in. × 0.99 in.)

Weight.. Approx. 250 g (8.8 oz)

Safety

If you need to clean the module, wipe it with a dry towel.

Safety Voltages

Connect only voltages that are within these limits.

Between any two terminals .... ± 30 V max

Isolation

    Channel-to-channel..........................No isolation between channels

    Channel-to-earth ground

        Continuous ....60 VDC,
                           Measurement Category I

        Withstand ....$1,000\ V_{rms}$, verified by a 5 s
                           dielectric withstand test

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as MAINS voltage. MAINS is a hazardous live electrical supply system that powers equipment. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics. Do not connect the NI USB-9237 to signals or use for measurements within Measurement Categories II, III, or IV.

Safety Standards

The NI USB-9237 is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 612010-1

Note For UL and other safety certifications, refer to the product label, or visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Hazardous Locations

The NI USB-9237 is not certified for use in hazardous locations.

Environmental

The NI USB-9237 device is intended for indoor use only.

Operating temperature
(IEC60068-2-1, IEC 60068-2-2) ....0 to 60 °C

Storage temperature
(IEC60068-2-1, IEC 60068-2-2) ....–40 to 85 °C

Ingress protection ....IP 40

Operating humidity
(IEC 60068-2-56) .... 10 to 90% RH,
noncondensing

Storage humidity
(IEC 60068-2-56) .... 5 to 95% RH,
noncondensing

Maximum altitude .... 2,000 m

Pollution Degree (IEC 60664) 2

Electromagnetic Compatibility

This product is designed to meet the requirements of the following
standards of EMC for electrical equipment for measurement, control,
and laboratory use:

- EN 61326 EMC requirements; Minimum Immunity

- EN 55011 Emissions; Group 1, Class A

- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A

Note For EMC compliance, operate this device with double-shielded cables.

CE Compliance

This product meets the essential requirements of applicable European
Directives, as amended for CE marking, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)

- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Note Refer to the Declaration of Conformity (DoC) for this product for any additional
regulatory compliance information. To obtain the DoC for this product, visit
ni.com/certification, search by model number or product line, and click the
appropriate link in the Certification column.

Environmental Management

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at `ni.com/environment`. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of their life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit `ni.com/environment/weee.htm`.

电子信息产品污染控制管理办法 （中国 RoHS）

中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 `ni.com/environment/rohs_china`。(For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)

Calibration

You can obtain the calibration certificate for the NI USB-9237 at `ni.com/calibration`.

Calibration interval ....1 year

Where to Go for Support

The National Instruments Web site is your complete resource for technical support. At `ni.com/support` you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at `ni.com/support` and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 1800 300 800, Austria 43 662 457990-0,
Belgium 32 (0) 2 757 0020, Brazil 55 11 3262 3599,
Canada 800 433 3488, China 86 21 5050 9800,
Czech Republic 420 224 235 774, Denmark 45 45 76 26 00,
Finland 358 (0) 9 725 72511, France 01 57 66 24 24,
Germany 49 89 7413130, India 91 80 41190000, Israel 972 3 6393737,
Italy 39 02 41309277, Japan 0120-527196, Korea 82 02 3451 3400,
Lebanon 961 (0) 1 33 28 28, Malaysia 1800 887710,
Mexico 01 800 010 0793, Netherlands 31 (0) 348 433 466,
New Zealand 0800 553 322, Norway 47 (0) 66 90 76 60,
Poland 48 22 3390150, Portugal 351 210 311 210, Russia 7 495 783 6851,
Singapore 1800 226 5886, Slovenia 386 3 425 42 00,
South Africa 27 0 11 805 8197, Spain 34 91 640 0085,
Sweden 46 (0) 8 587 895 00, Switzerland 41 56 2005151,
Taiwan 886 02 2377 2222, Thailand 662 278 6777,
Turkey 90 212 279 3031, United Kingdom 44 (0) 1635 52354